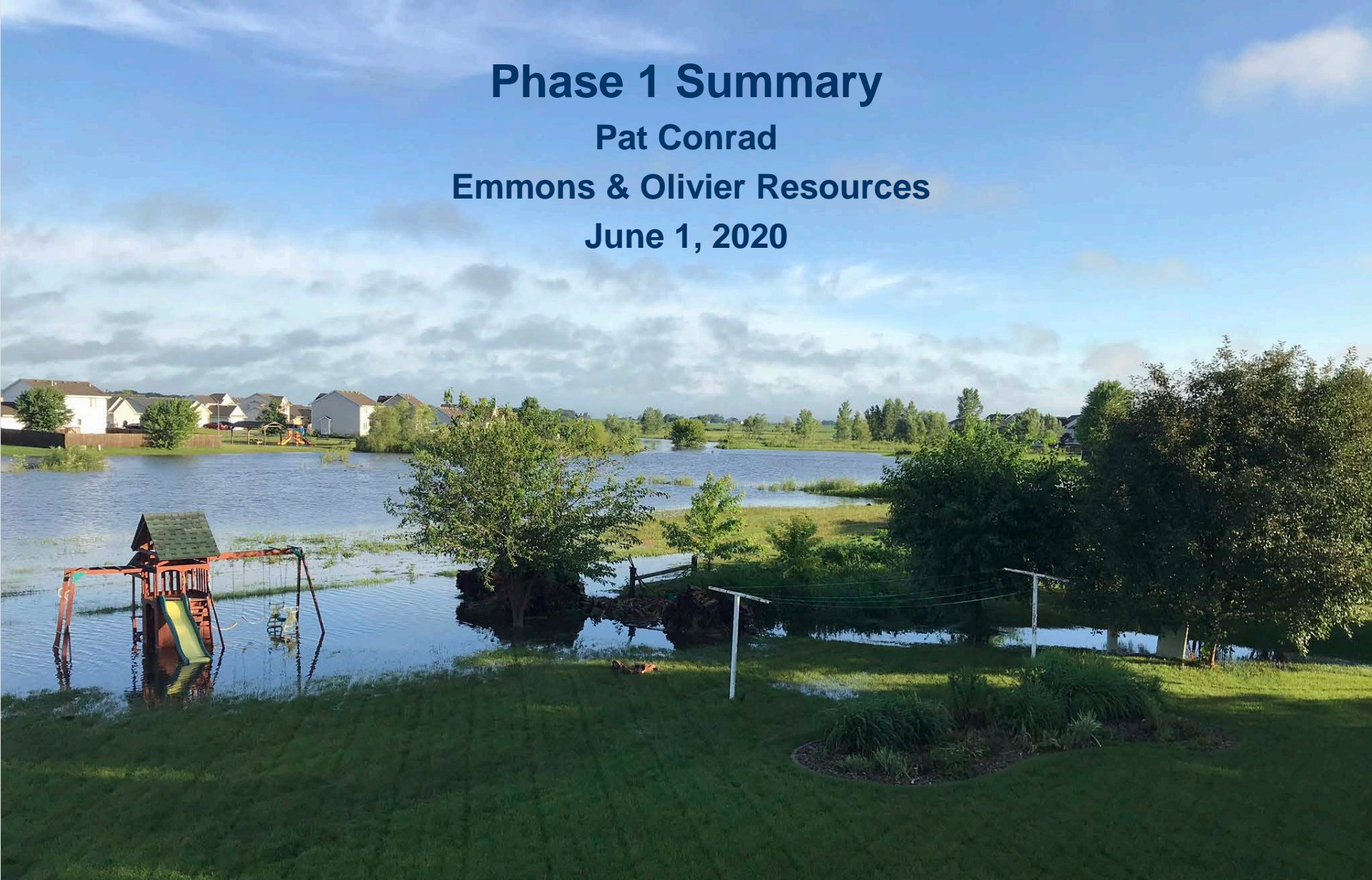


Phase 1 Summary

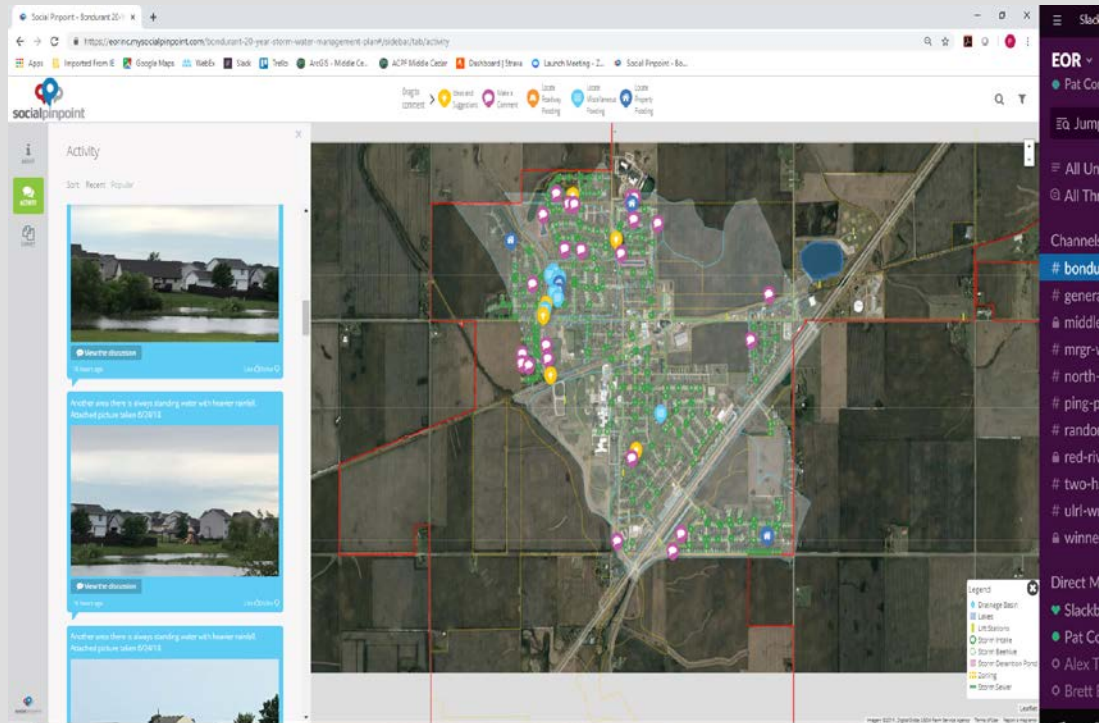
Pat Conrad

Emmons & Olivier Resources

June 1, 2020



Community Engagement



Social PinPoint



Public Open House

Including Low Impact Development (LID) in City Standards

1. Protecting unique site features and characteristics;
2. Maintaining existing drainage patterns;
3. Preventing sediment, nutrients, and other pollutants from entering stormwater;
4. Reducing stormwater discharge velocities and rates;
5. Reducing the volume of stormwater generated on site; and
6. Removing sediment, nutrients, and other pollutants from stormwater.



- **Policy Framework**

1. Updated Erosion & Sediment Controls implemented during land disturbances
2. Low Impact Design (LID) focused design processes
3. Development application submittal requirements
4. Stormwater management plan performance standards
5. Administrative processes



City-wide Modeling

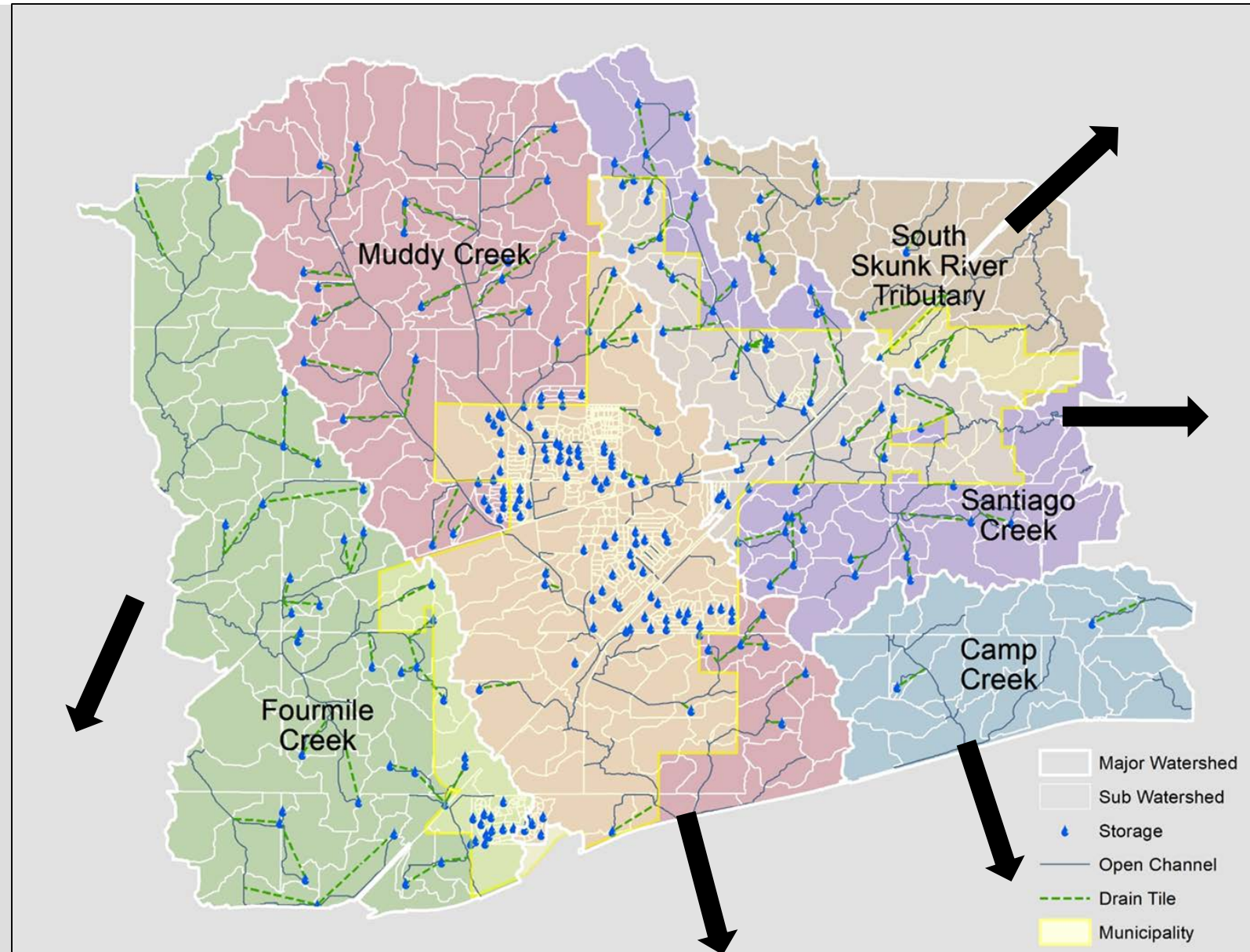
“All models are wrong, but some are useful” – George E.P. Box

“Design Storms” vs Actual Storms

Simulate the system, test scenarios

H & H Modeling:

- Hydrology – rain and runoff



City-wide Modeling

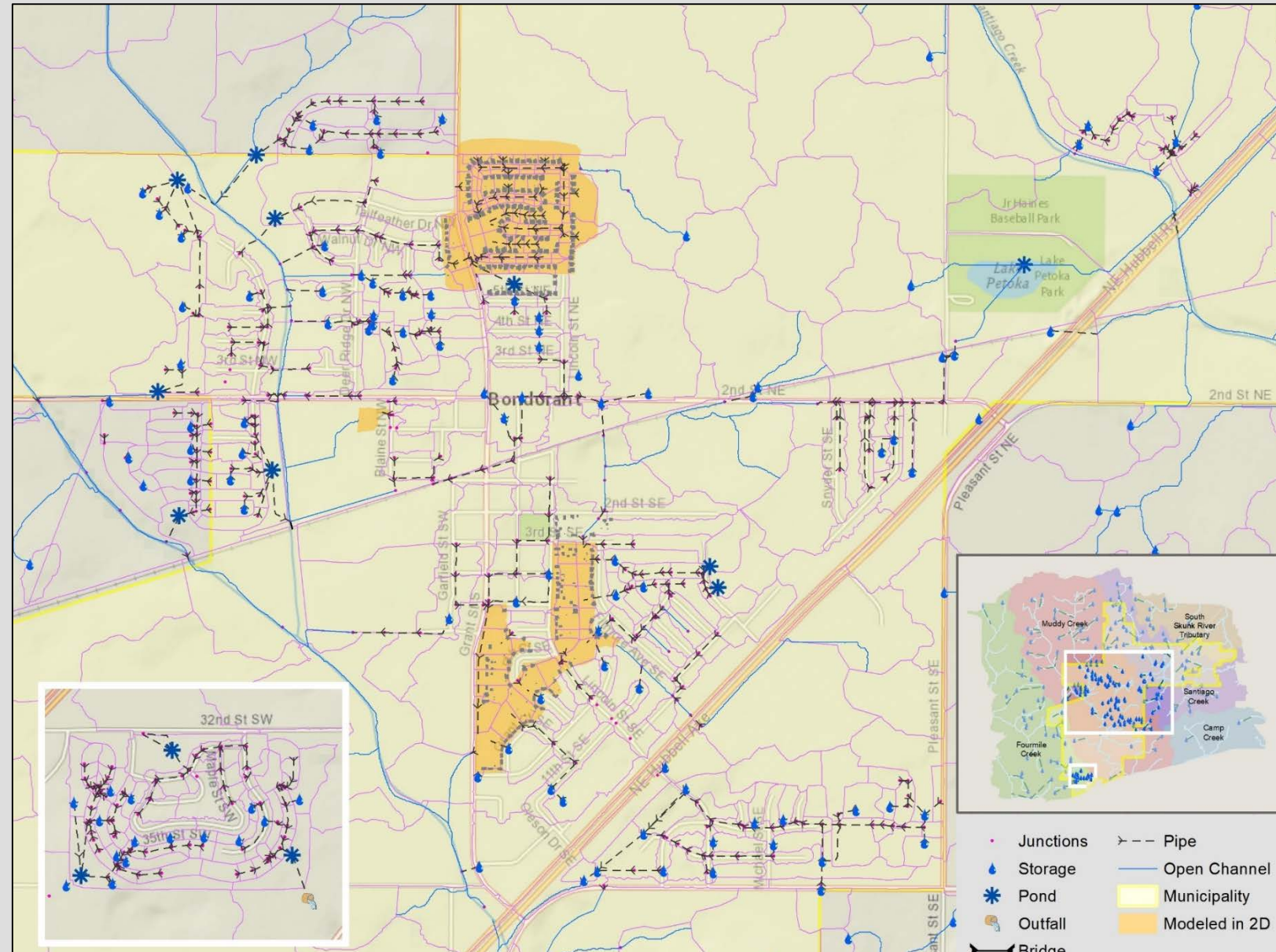
“All models are wrong, but some are useful” – George E.P. Box

“Design Storms” vs Actual Storms

Simulate the system, test scenarios

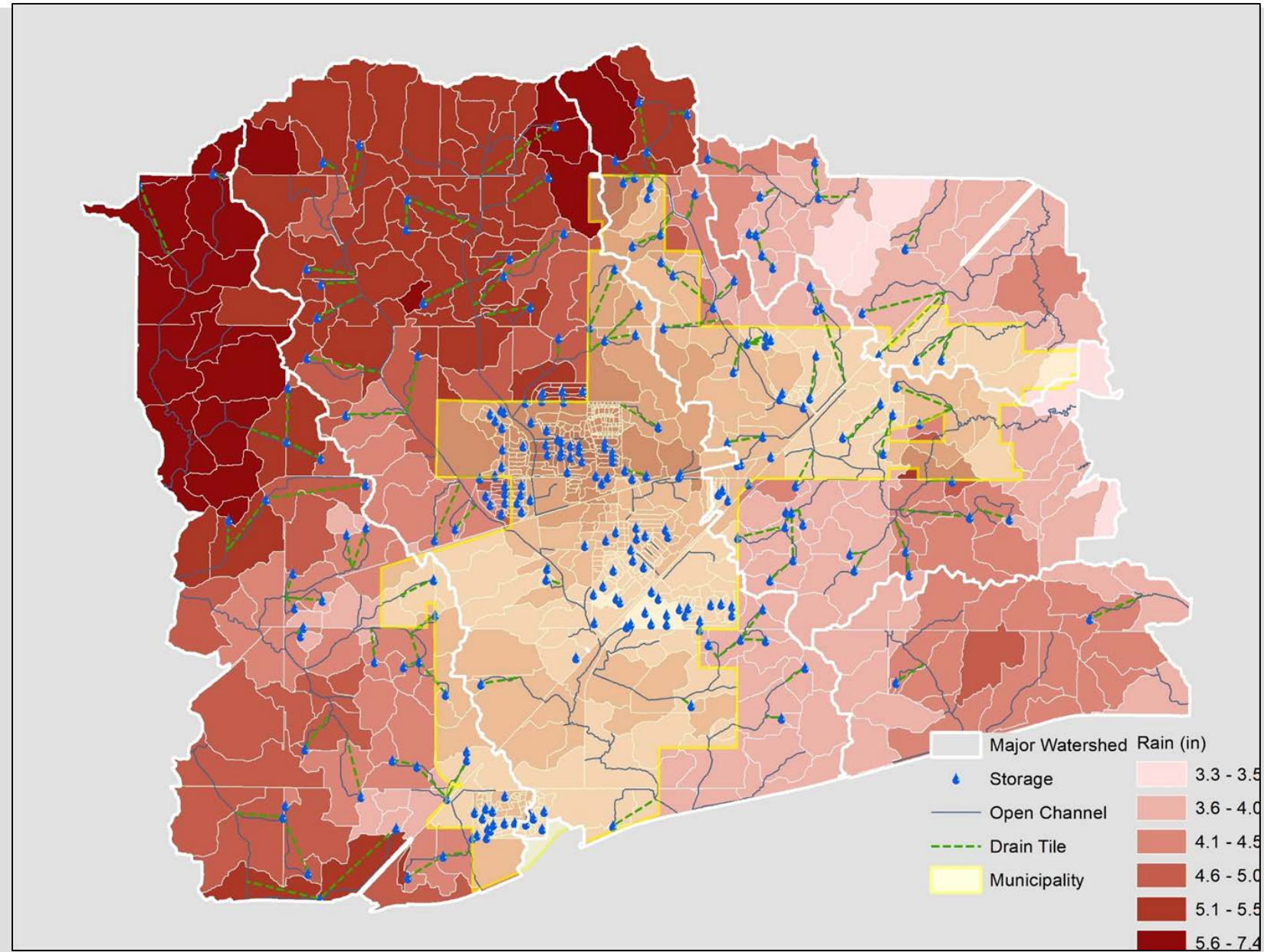
H & H Modeling:

- Hydraulic – pipes and conveyance systems

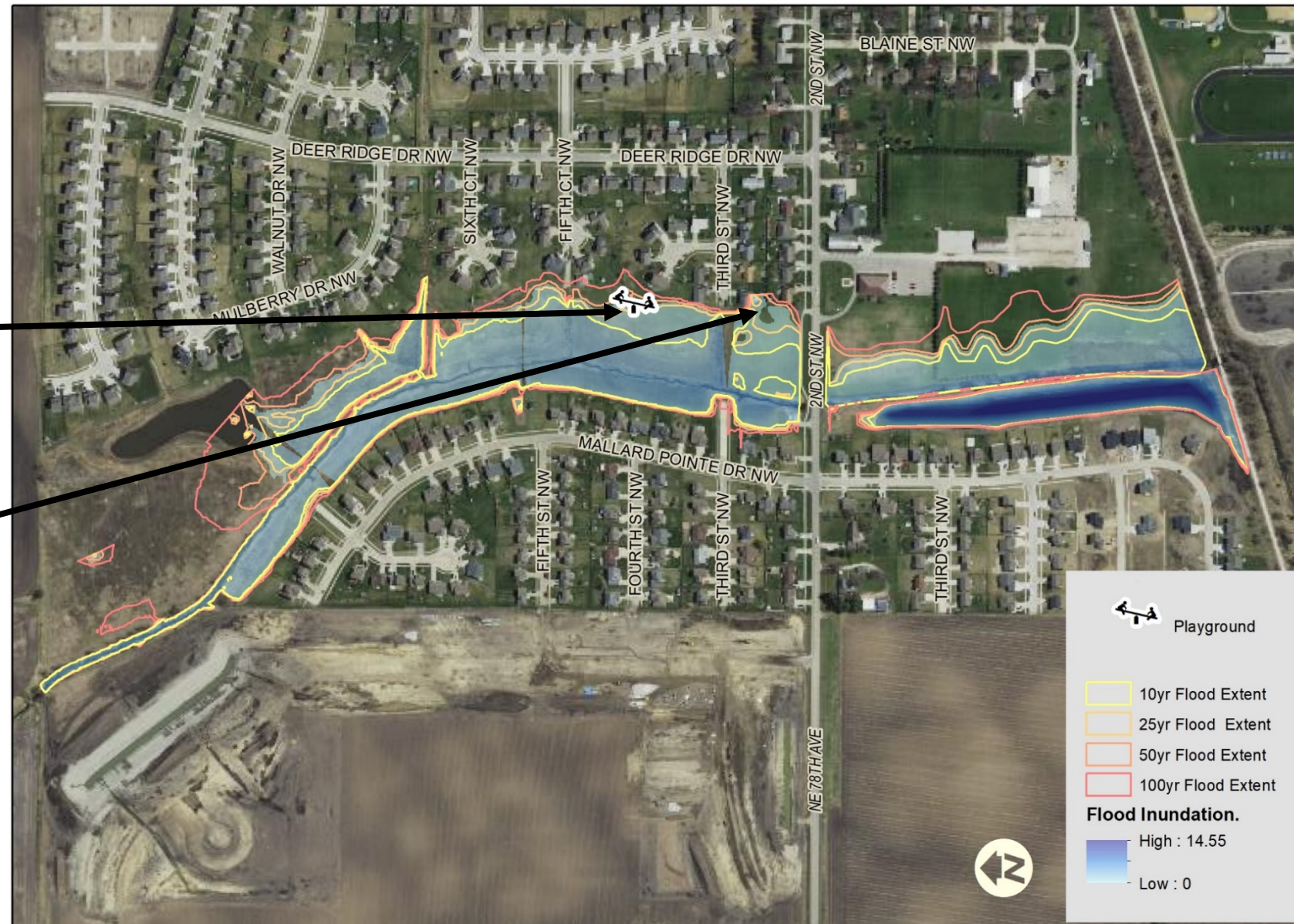
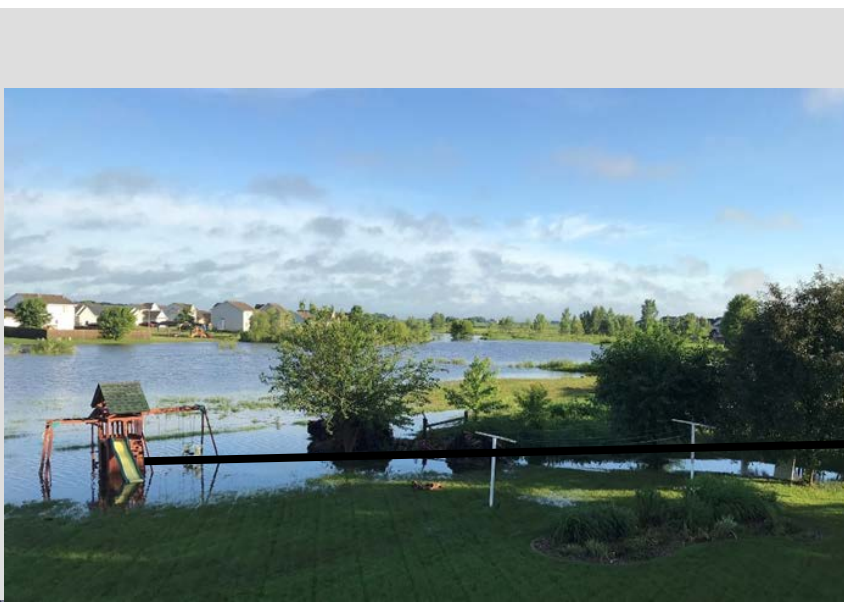


Model Construction: Validation

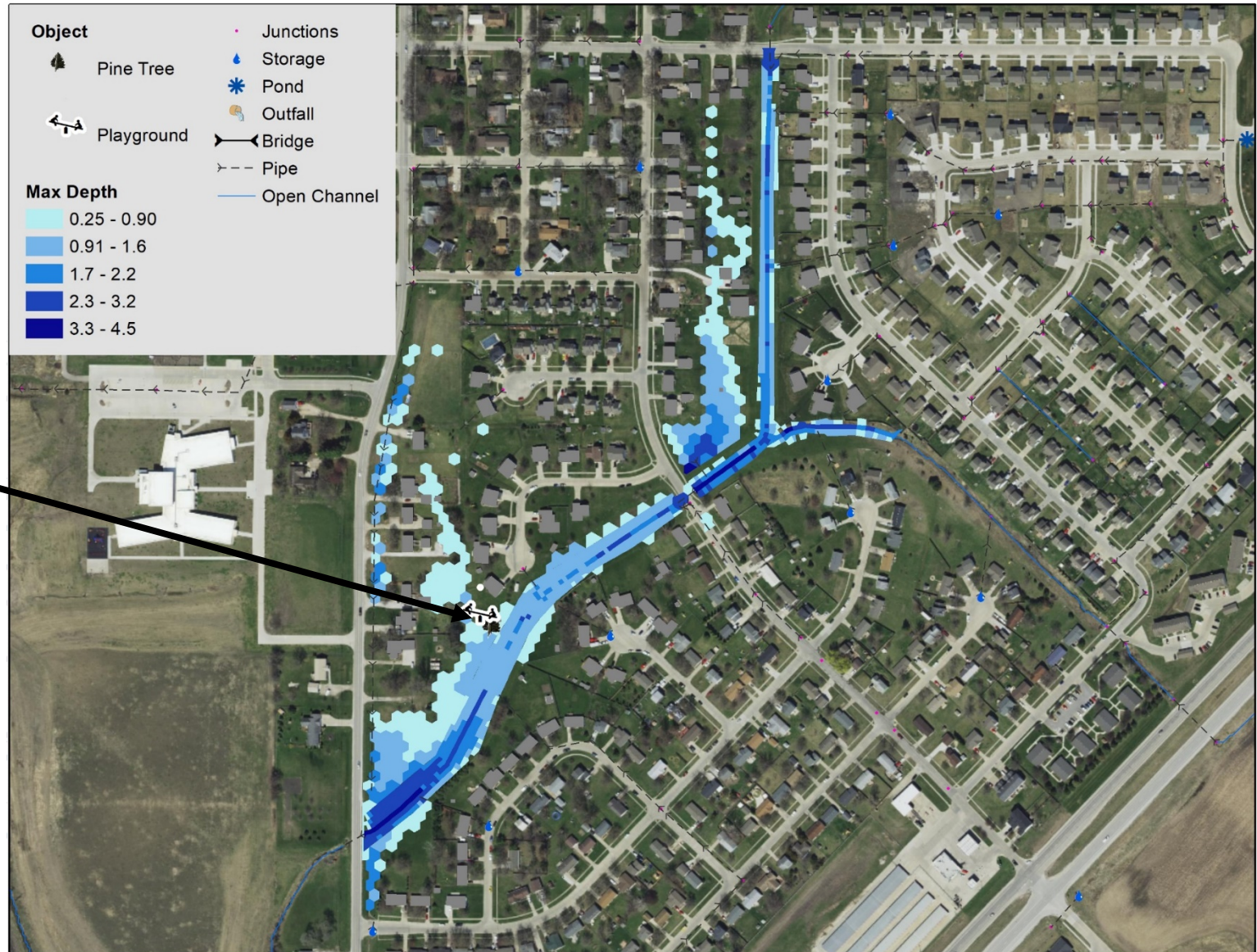
- **June 30th-July 1st 2018 Rainfall**
- **> 10” observed at some sites**
- **Average Rainfall of 4.48 inches in 4 hours**
- **Flooding extents documented by residents**



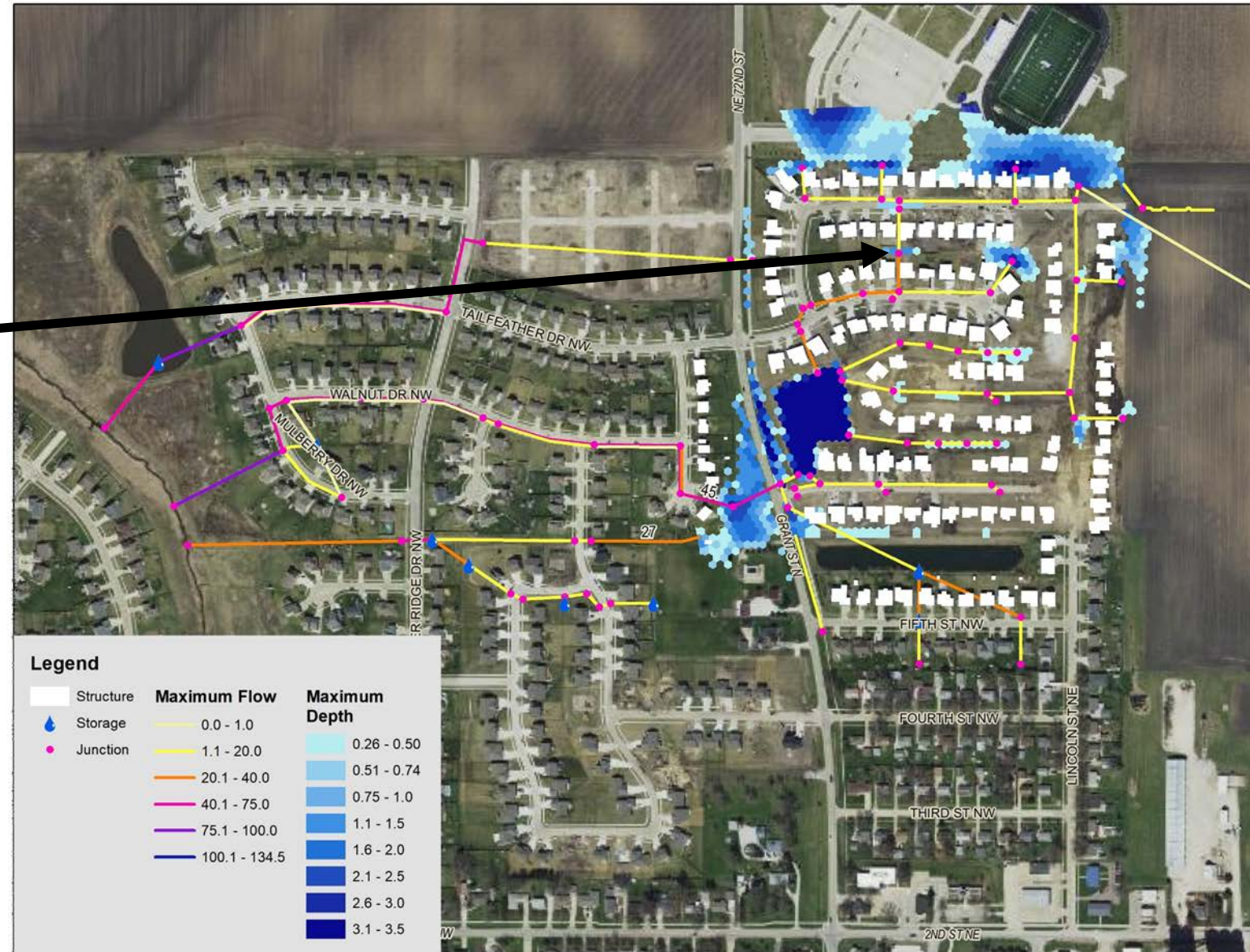
Model Construction: Muddy Creek Flood Extent



Model Construction: Drainageway Flood Extent

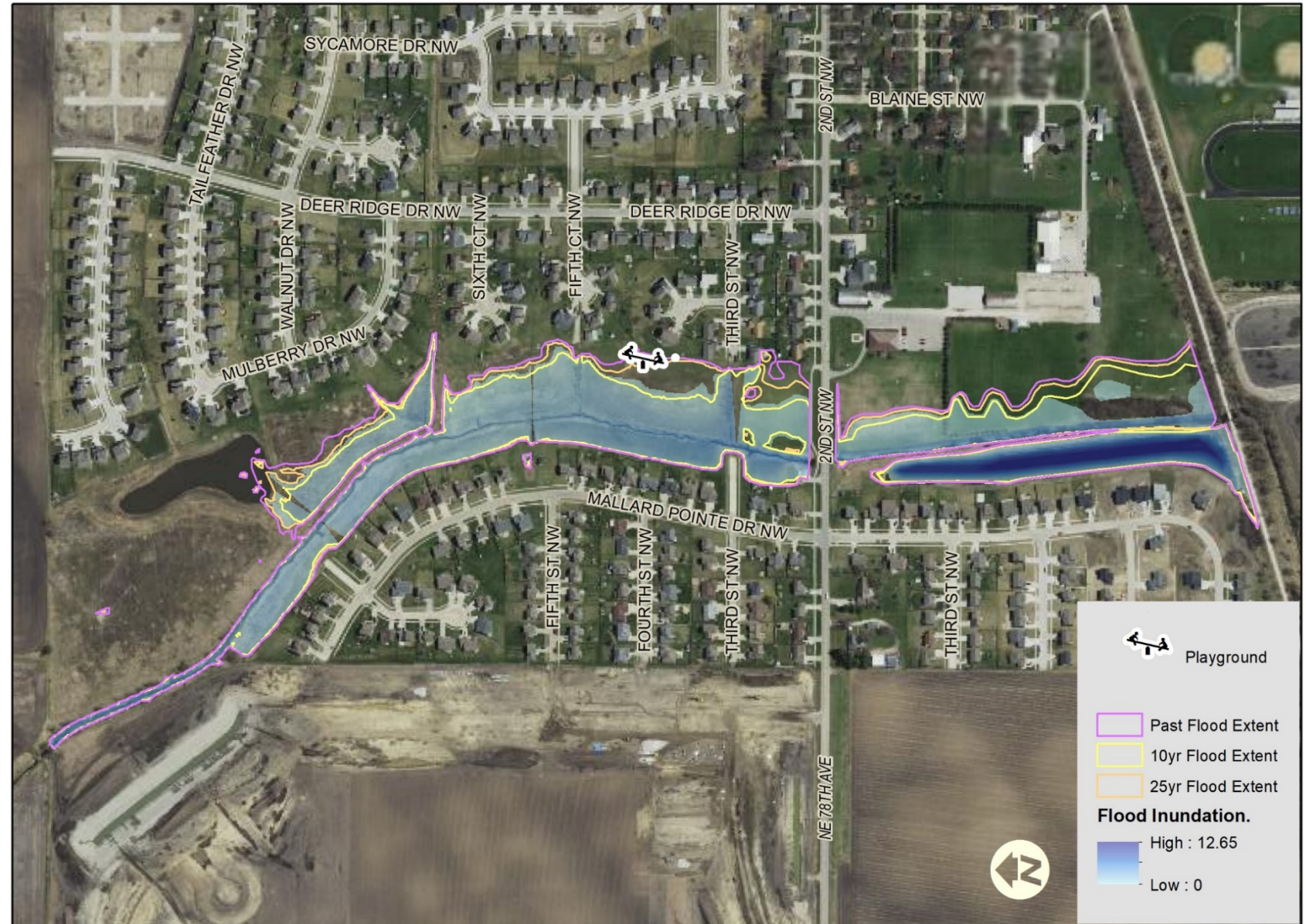


Model Construction: Pleasant Grove Neighborhood



Findings: Recent & Upcoming Improvements

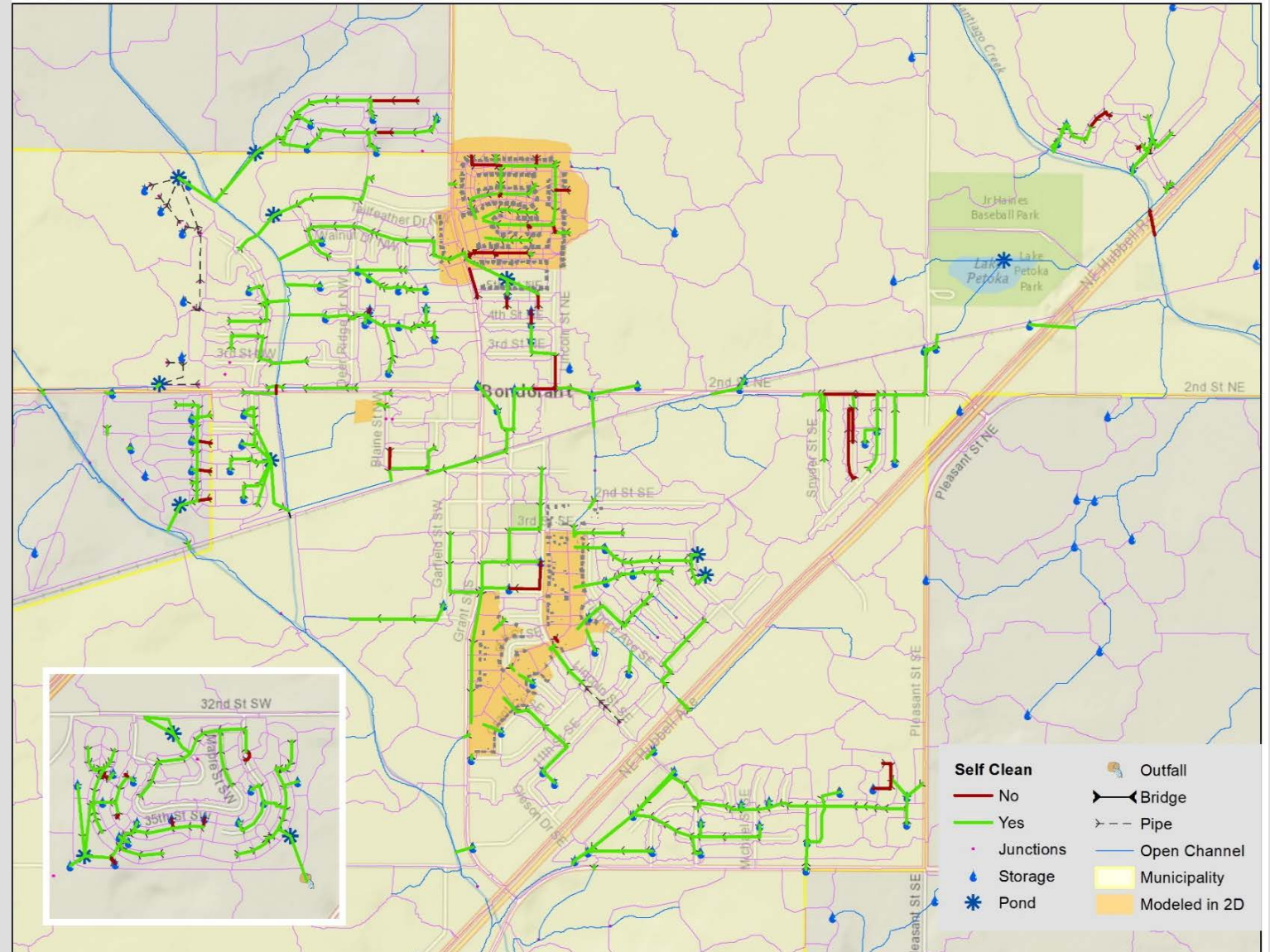
- Muddy Creek
- Lincoln St. SE
- Pleasant Grove Improvements
- Pleasant Grove Bypass



Stormsewer System Modeling: Self-cleaning Pipes

Self-cleaning Pipes

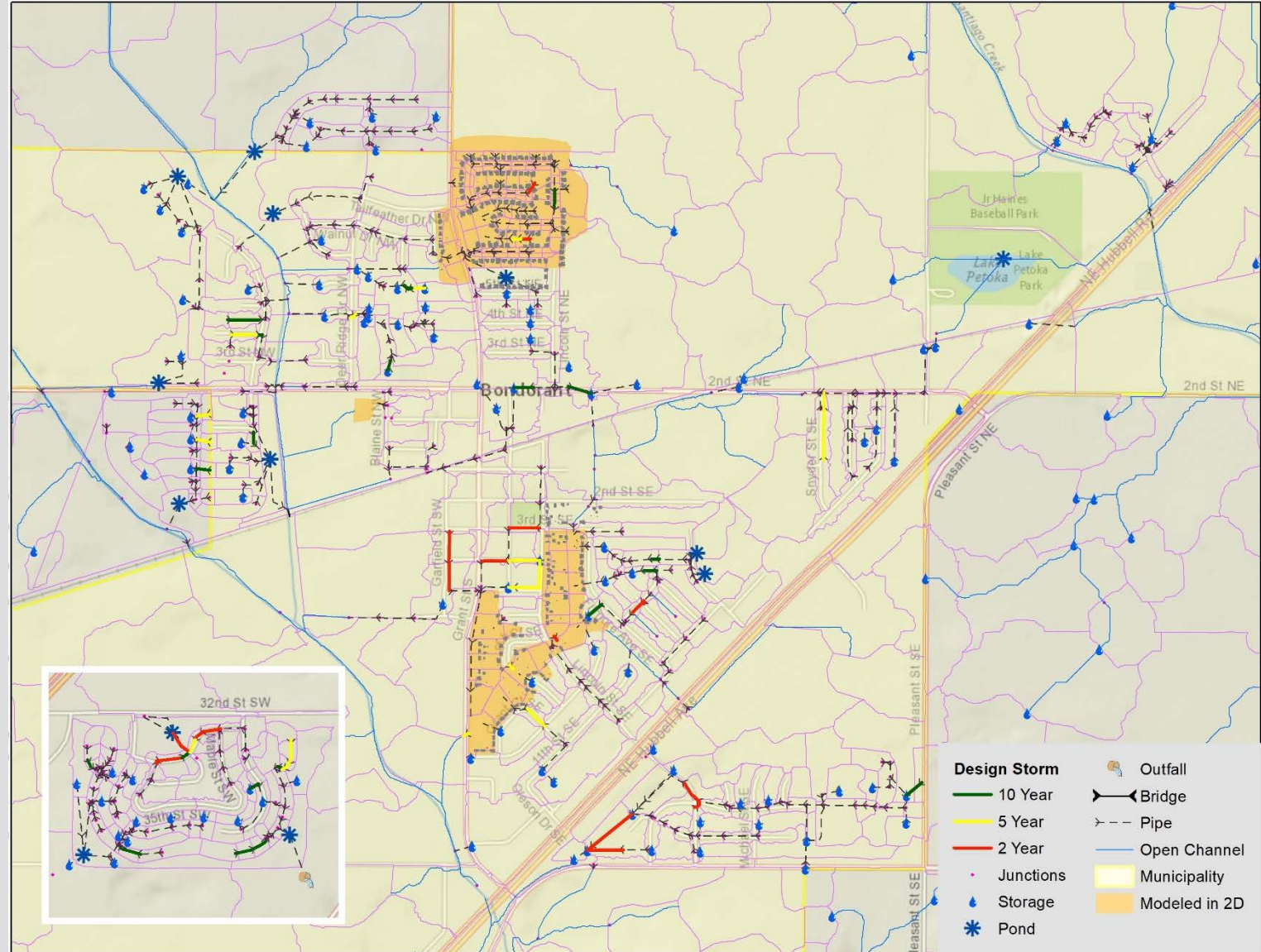
- Stormsewer pipes with predicted maximum velocities less than 2 fps during the 2 year-24 hour storm.
- Sediment accumulation
- Capacity
- Maintenance



Stormsewer System Modeling: Capacity Limitations

Capacity Limitations

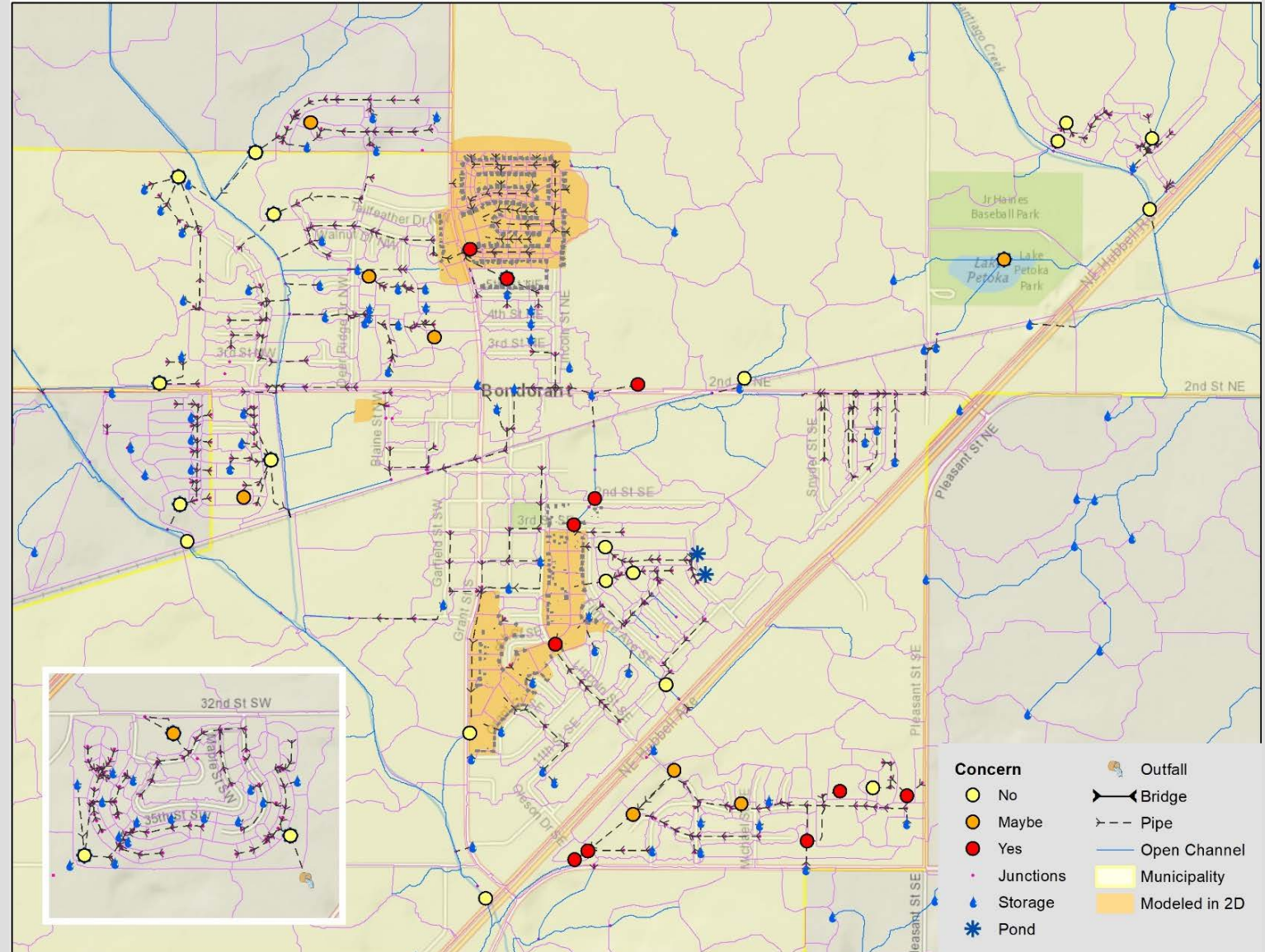
- Stormsewer pipes
 - 2 year – High Priority
 - 5 year
 - 10 year
- Wolf Creek Neighborhood
- 3rd St. & 5th St.



Stormsewer System Modeling: 100 year Flood

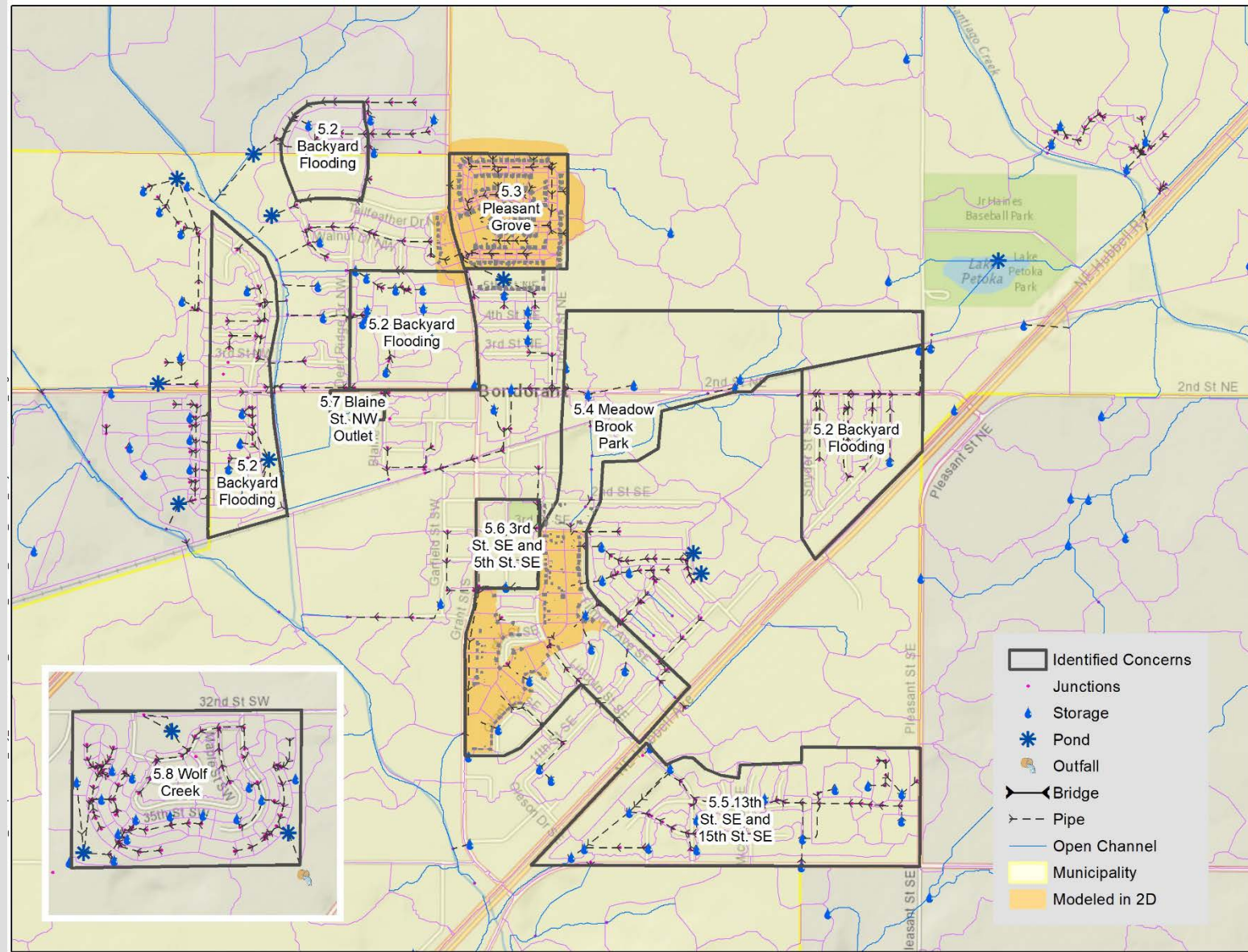
100 year Flood Passage

- Crossings & Ponds
- Safe conveyance
 - 1 foot freeboard
 - Roadways & Homes



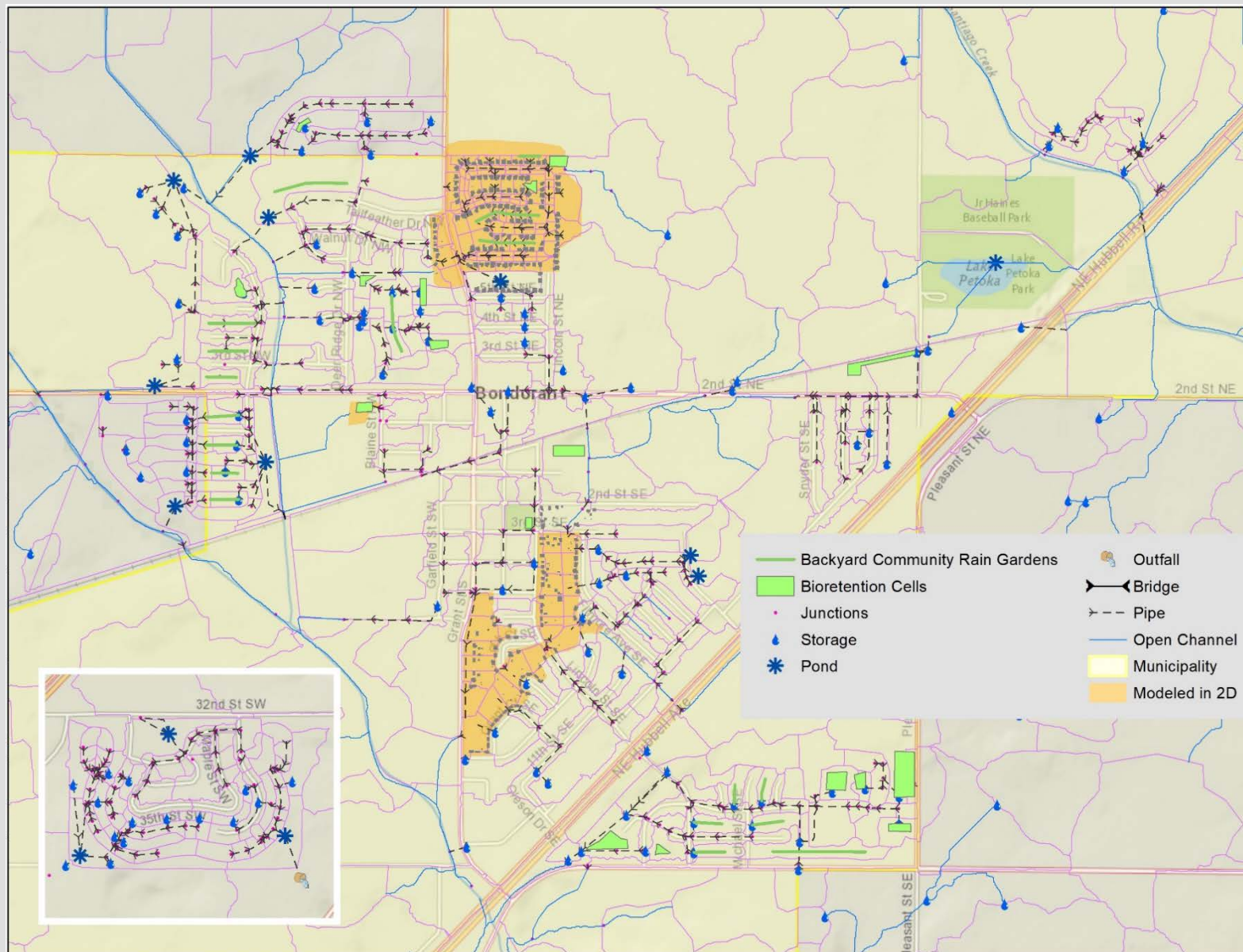
Primary Areas of Flooding

1. Backyard Flooding
2. Pleasant Grove
3. Meadow Brook Park
4. 13th St. SE & 15th St. SE
5. 3rd St. SE & 5th St. SE
6. Blaine St. NW Outlet
7. Wolf Creek Neighborhood



Backyard Flooding Areas

- Twenty-five Social Pinpoint responses
- Wide-spread - 15.3 acres
- Green Infrastructure Approach
 - Raingardens
 - Bioretention cells



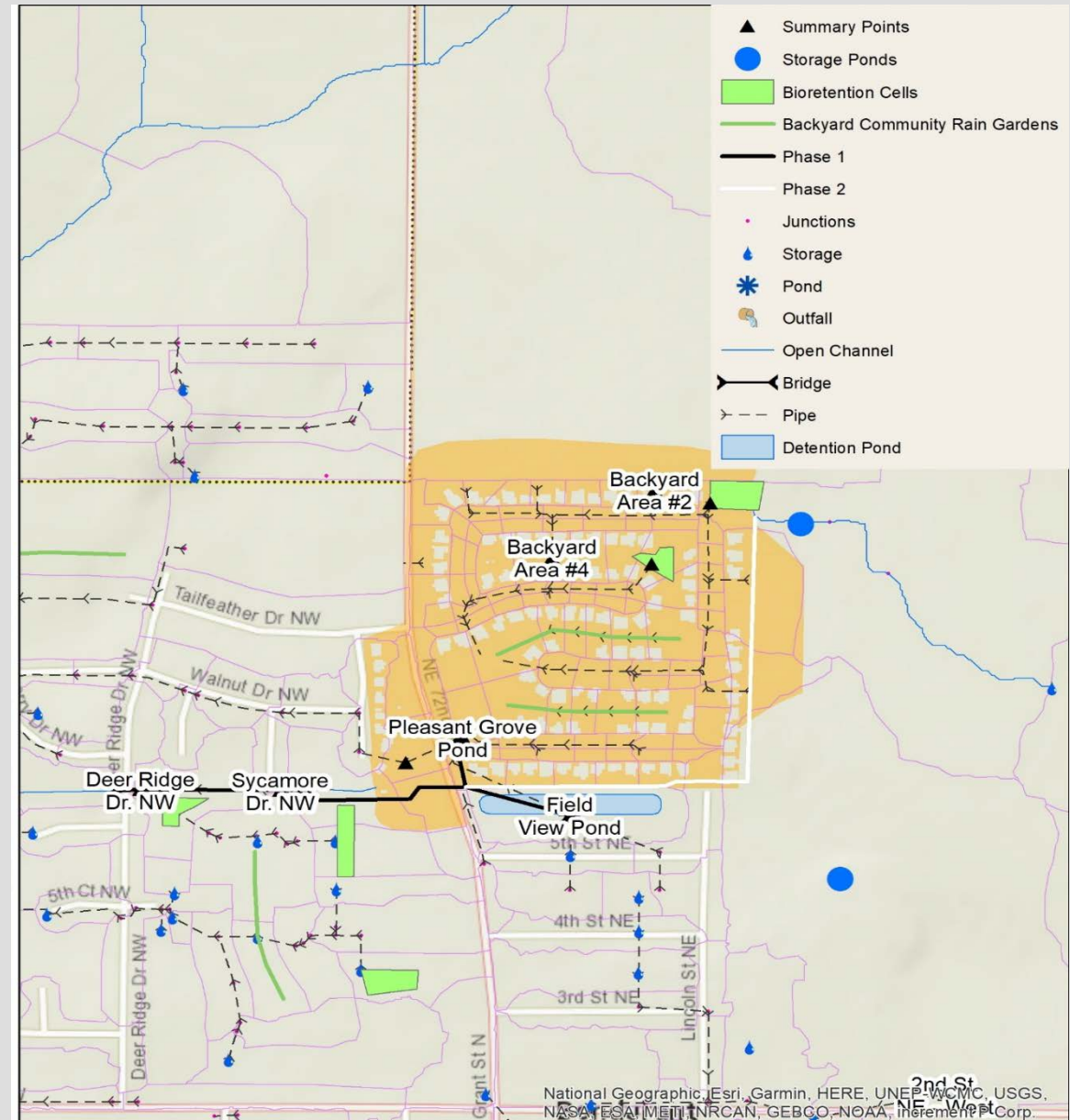
Backyard Flooding Areas



Location	5 year-24 hour HWL (ft)		100 year-24 hour HWL (ft)	
	Existing	Community Rain Garden	Existing	Community Rain Garden
North of 5 th St. NW	941.8	-0.1	940.8	-0.
North of 4 th St. NW	942.7	-0.5	945.5	-2.
North of 3 rd St. NW	949.1	-0.2	947.4	-1.
North of 2 nd St. NW	945.3	-0.1	945.4	-0.
North of 1 st St. NW	944.4	-0.2	944.6	-0.
North of 2 nd St. NW	942.5	-0.2	942.7	-0.
North of 3 rd St. NW	943.4	-0.8	942.6	-0.
North of 4 th St. NW	943.3	-0.1	943.5	-0.
Aspen Dr. NW	942.0	-0.3	943	0.
Deer Ridge Dr. NW Detention Pond	953.4	-0.8	954.6	-1.
Intersection of Trail and Pleasant St. NE	971.8	-0.3	970.6	-0.

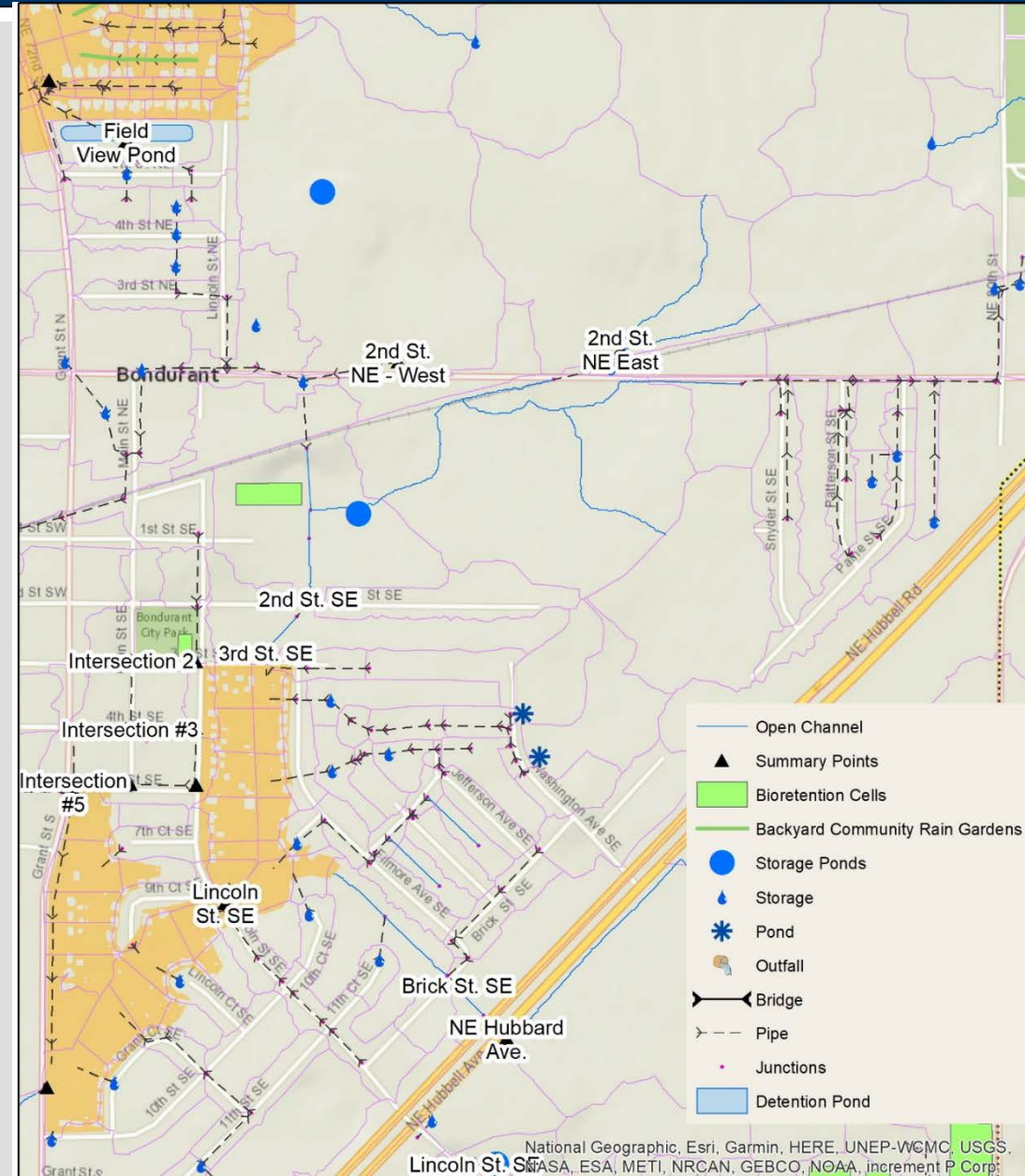
Pleasant Grove Neighborhood

- Nine specific areas evaluated
- 5 year & 100 year high water levels
- Three scenarios
 - Proposed Phase 2 Pipe
 - Upstream Ponding
 - Upstream Ponding and Green Infrastructure

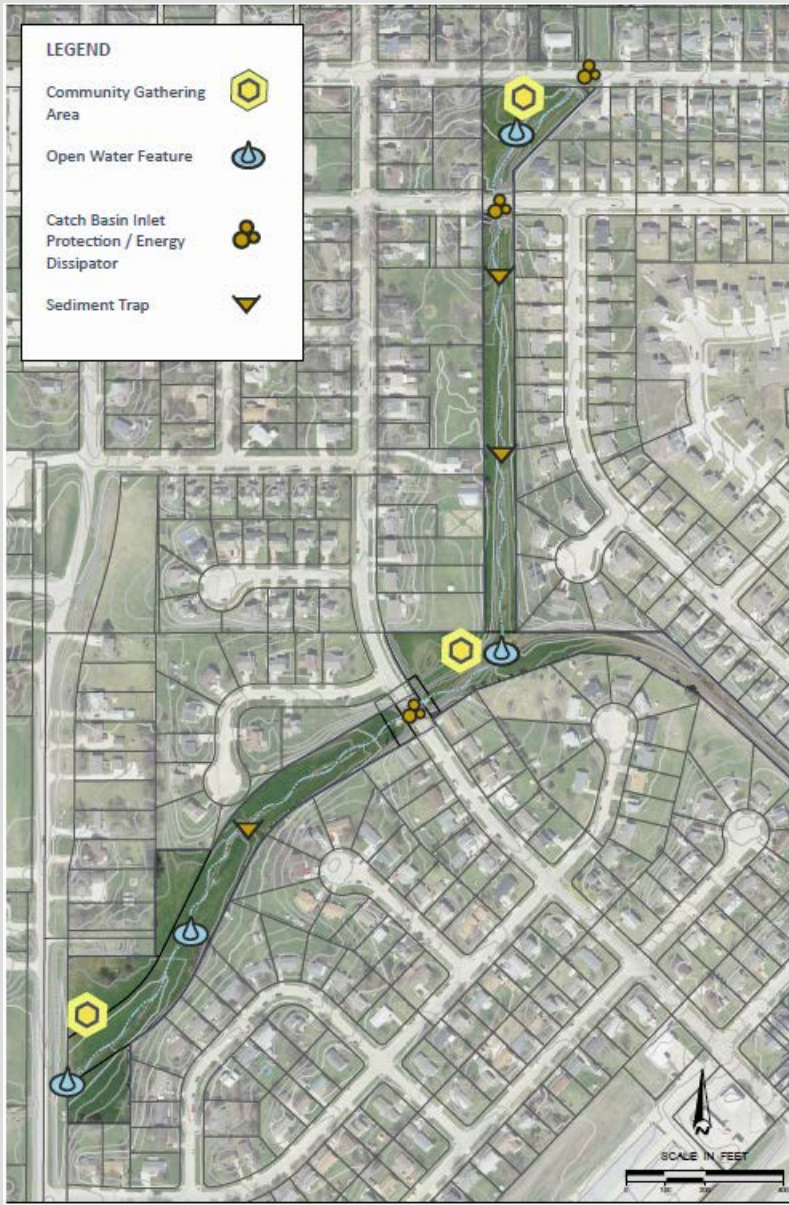


Meadow Brook Park

- Eight specific areas evaluated
- 5 year & 100 year high water levels
- Four scenarios
 - Pond 1
 - Pond 2
 - Bioretention Cell
 - Meadow Brook Stormwater Park Concepts

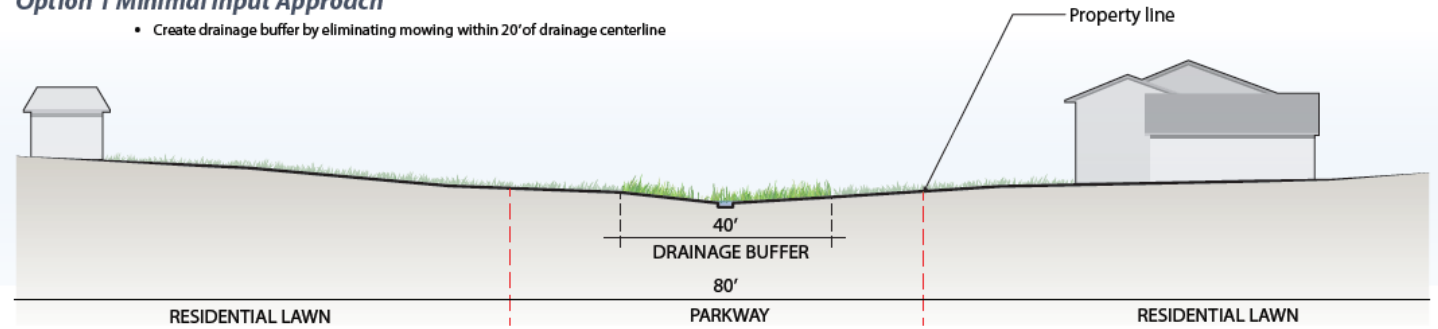


Meadow Brook Park: Stormwater Park Concepts



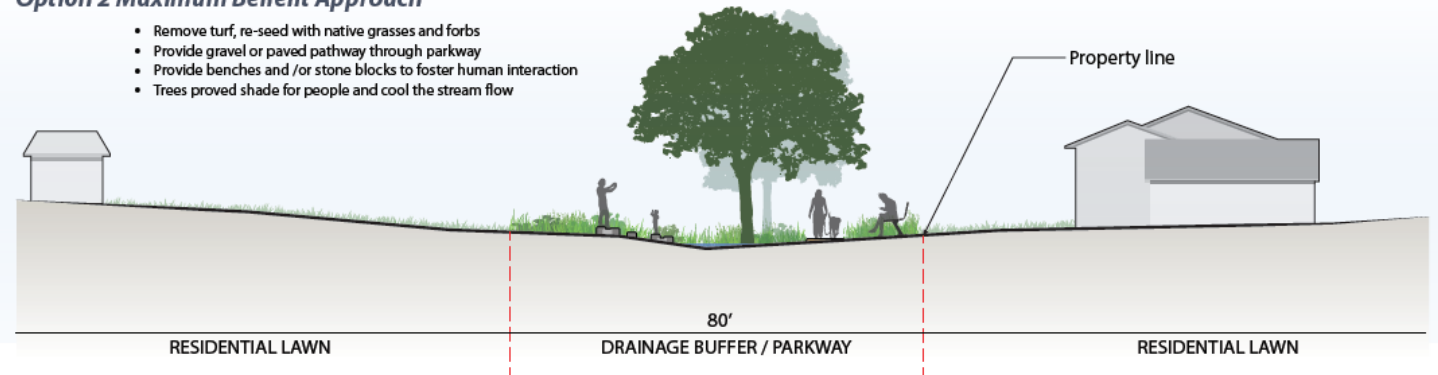
Option 1 Minimal Input Approach

- Create drainage buffer by eliminating mowing within 20' of drainage centerline



Option 2 Maximum Benefit Approach

- Remove turf, re-seed with native grasses and forbs
- Provide gravel or paved pathway through parkway
- Provide benches and /or stone blocks to foster human interaction
- Trees provide shade for people and cool the stream flow



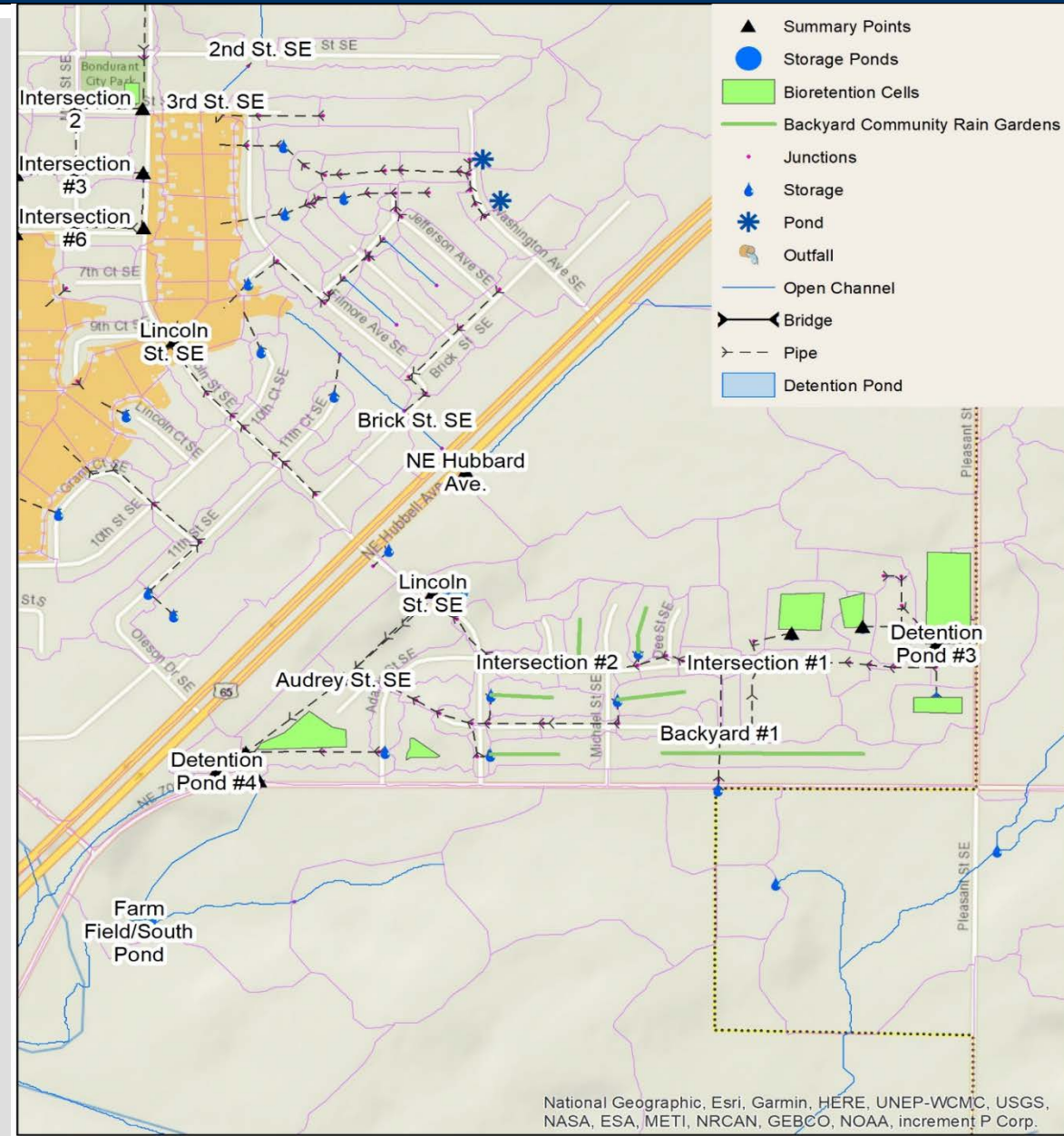
Scale: 1"=20'

MEADOWBROOK PARK DRAINAGE IMPROVEMENT CONCEPTS

City of Bondurant
April 22, 2019

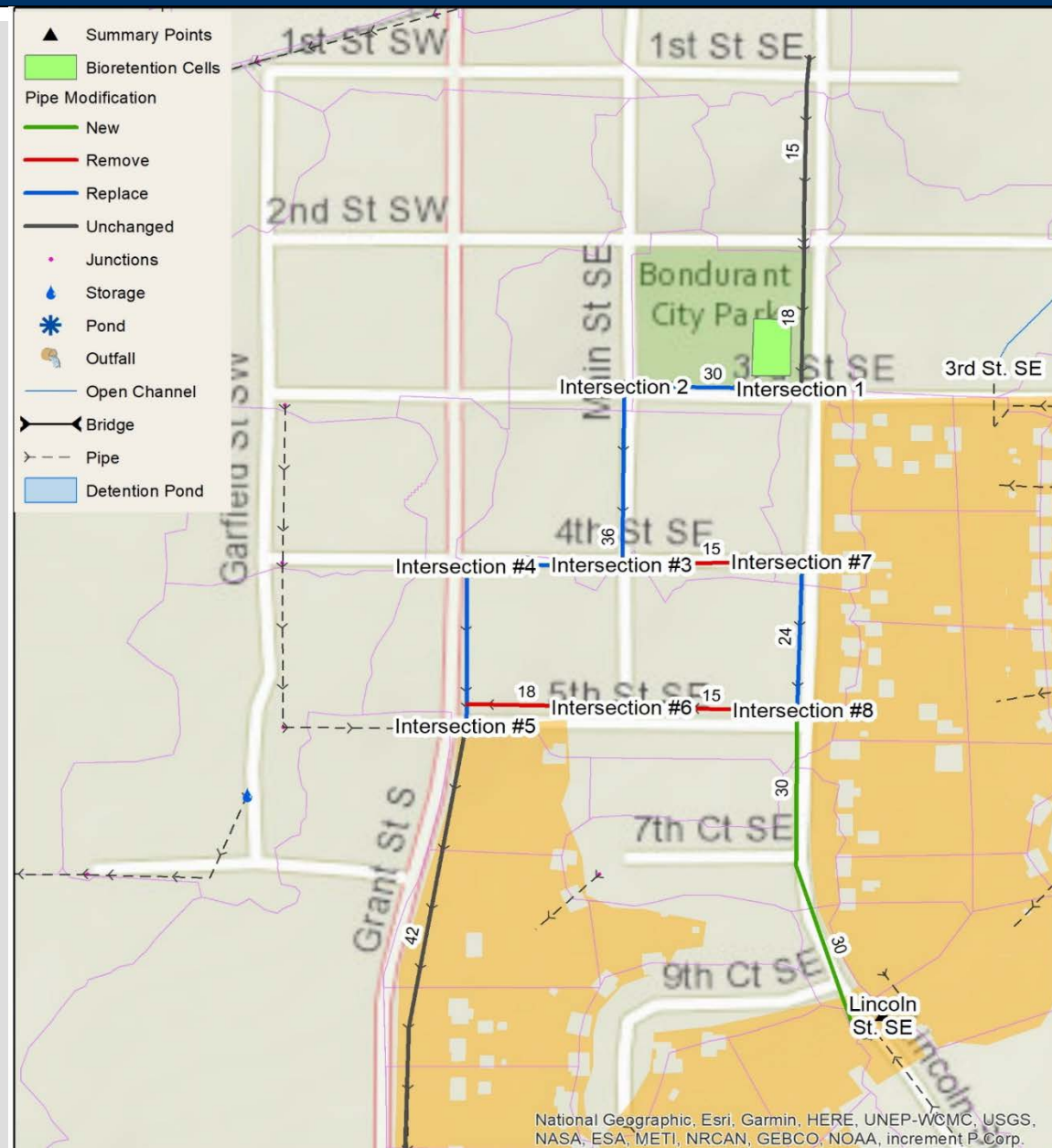
13th St. & 15th St. SE Neighborhood

- Thirteen specific areas evaluated
- 5 year & 100 year high water levels
- Three scenarios
 - Green Infrastructure Retrofits
 - Intercepting 13th St SE storm sewer at Cove & expanding storage above Lincoln
 - Expanding capacity from Lincoln to 15th & regional storage south of 15th



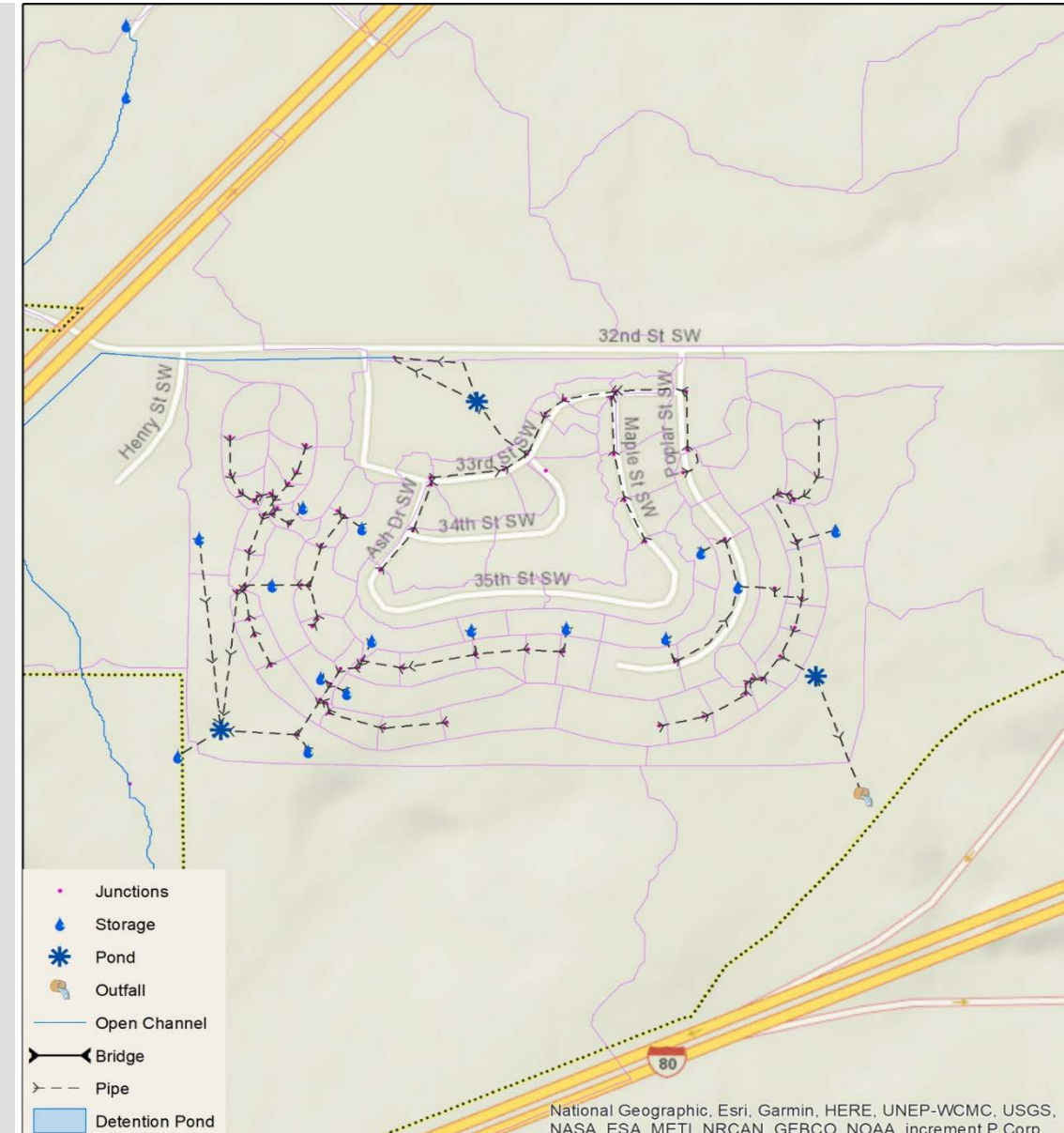
3rd St. & 5th St. SE Neighborhood

- Eight Street Intersections Evaluated
- 5 year high water levels
- Capacity limited area
- Stormsewer modifications
 - Size upgrades
 - Additional Pipes
 - Bio-infiltration cell



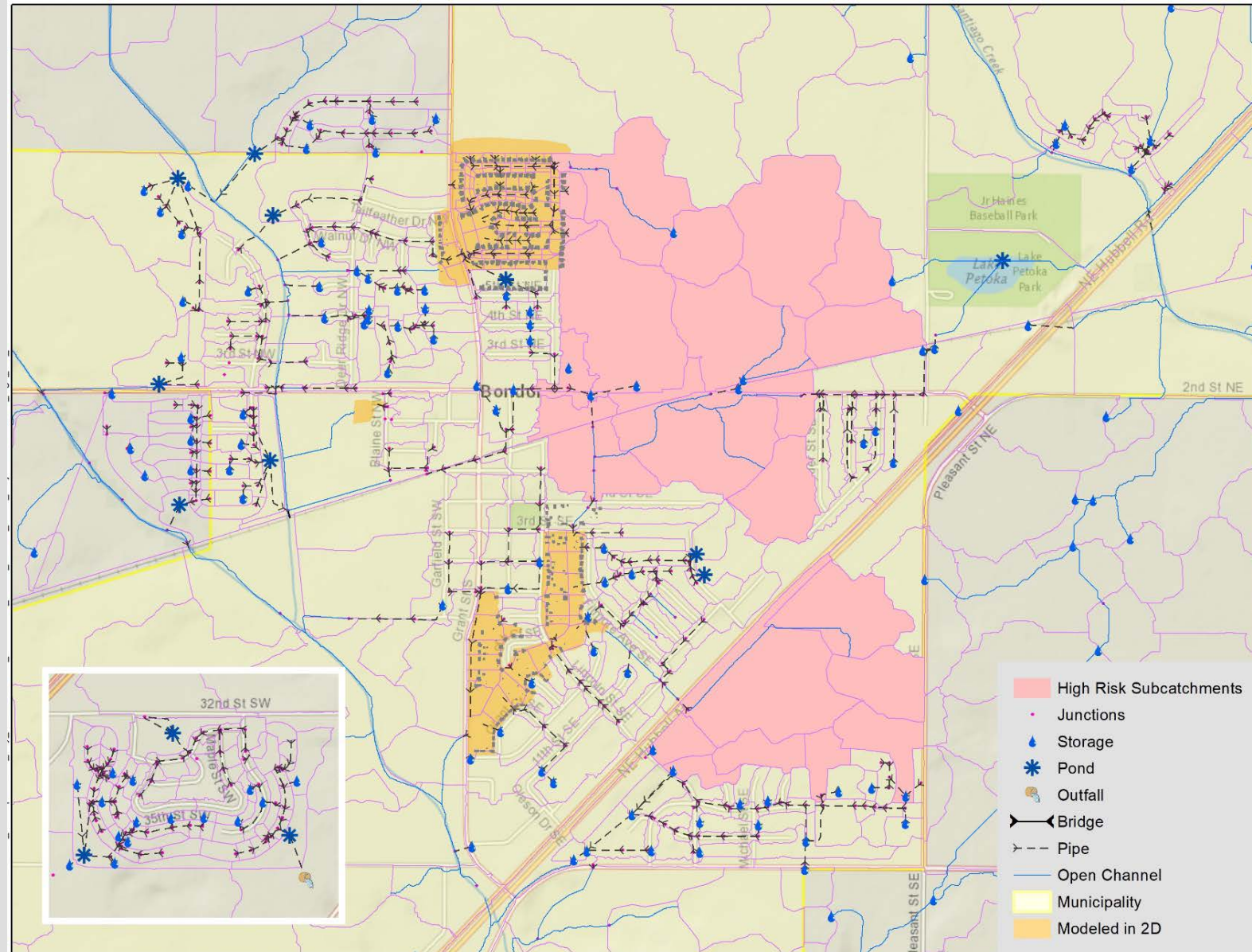
Wolf Creek Neighborhood

- Six specific areas evaluated
- Insufficient data to make recommendations
- Feasibility study needed



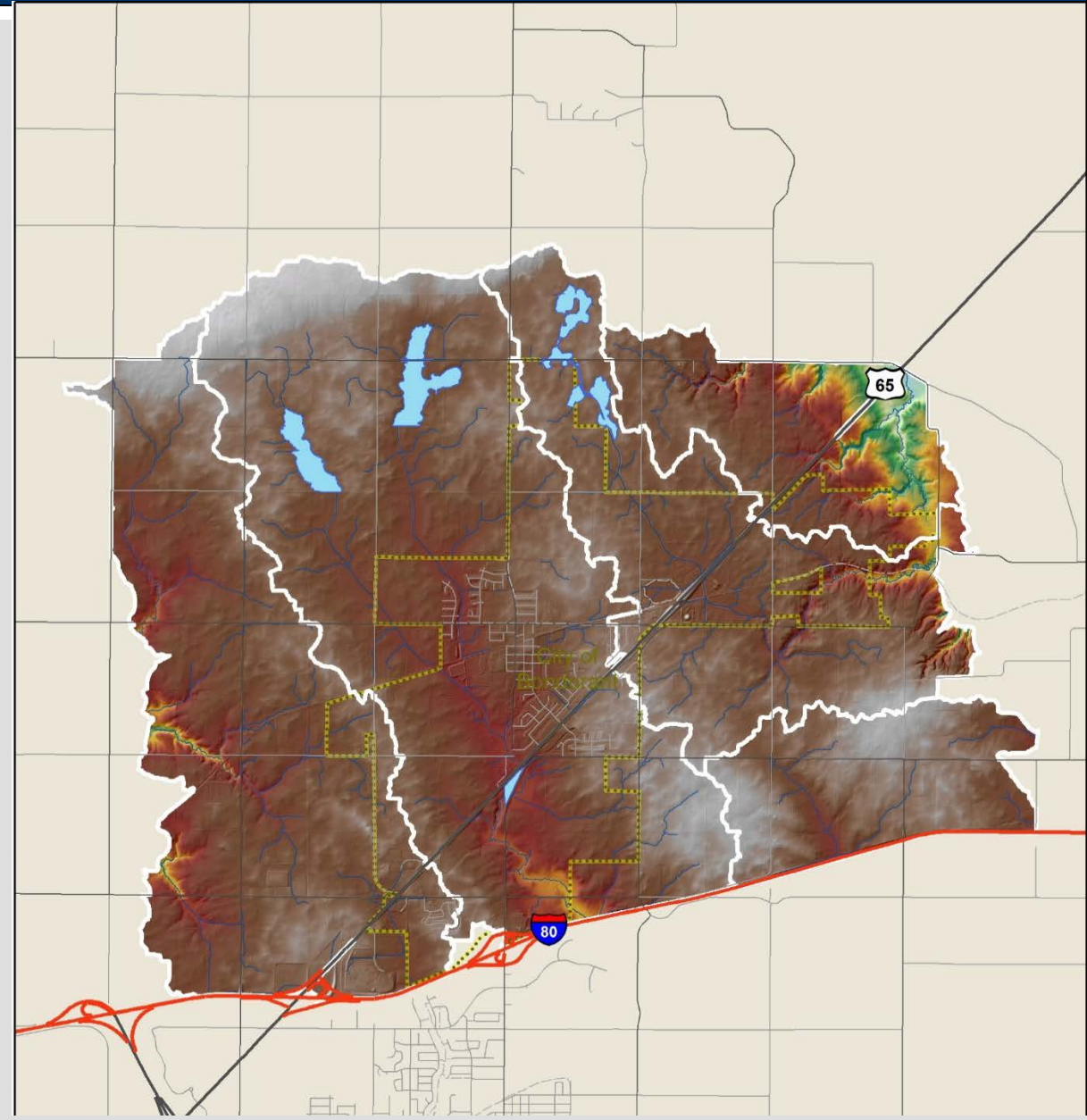
Mitigating Flooding from Future Growth

- High risk areas (pink)
- Upstream of capacity issues
- Additional controls as areas develop



Regional Storage Potential

- Ditch plugs or berms
- Prairie potholes



Prioritization Matrix

Category	Low Priority (+0)	Medium Priority (+1)	High Priority (+3)
Cost (\$)	More than \$1.5M	\$1M to \$1.5M	Less than \$1M
Benefit Score	Bottom 33% of Ranking Average	Middle 33% of Ranking Average	Top 33% of Ranking Average
Number of Social Pinpoint Response	0 responses	At least 1 response	More than or equal to 5 responses
Number of Households	Less than 50	Between 50 and 100	More than 100
Downstream Impacts	Yes (-3)		No (+0)
Unknown Info	Yes (-1)		No (+0)
Public Amenity Potential	No (+0)		Yes (+1)
Water Quality Benefit	No (+0)		Yes (+2)

Prioritization Summary

Location	Recommendation	Ranking
Pleasant Grove	Pond & 30% GI	1
13th St. SE and 15th St. SE	South Pond & 30% GI	2
Meadow Brook Park	Ponds and Park Improvements	3
Blaine St. NW Outlet	Rain Garden	4
Wolf Creek	Feasibility Study	5
3rd St. SE and 5th St. SE	Pipe	6



Task 1. Water Quality Improvement Plan

- Characterize sources
- Identifies potential WQ improvements :
 - Lake Petocka drainage area,
 - Meadow Brook Park corridor,
 - Mud Creek/Hwy 65 site,
 - Wolf Creek Pond drainage area,
 - Former waste water lagoon site
- Identifies retrofits opportunities
- Develops strategies for bacteria
- Develops BMPs for City MS4

Task 2. Maintenance Plan & Staffing Analysis

Task 3. Stormwater Policy Implementation

- Updated erosion and sediment controls (ESC) implemented during land disturbances (construction)
- Low Impact Development (LID) focused design processes
- Development application submittal requirements
- Stormwater management (SWM) performance standards
- Administrative processes

Task 4. Stormwater Utility Rate Analysis

- Current and future costs SWMP
- Current and future costs of maintenance and operation
- Projected demands
- Funding of capital maintenance projects
- Property acquisition

Questions?

